

S/N 09/855,458
Page 19 of 26

REMARKS/DISCUSSION OF ISSUES

This response is intended as a full and complete response to the non-final Office Action mailed January 12, 2004. Claims 1-11, 14, 16-27, 30, 32-37, 39-59, 62, 64-76 and 96-125 are currently pending. As explained below, all of the pending claims are patentable.

I. CLAIM OBJECTION

Claim 5 is objected to because the word "Th" is misspelled. Claim 5 as presented in this Response shows no misspelling.

II. REJECTIONS UNDER 35 USC §112, FIRST PARAGRAPH

Claims 110-112, 122 and 124 stand rejected under 35 USC §112, first paragraph. Claims 110, 122 and 124 have been amended to address the rejection. Applicants submit that claims 110, 122 and 124 and claims 111 and 112 which depend from claim 110 satisfy the requirements of 35 USC §112, first paragraph, and are patentable thereunder.

III. REJECTIONS UNDER 35 USC §101

Claims 1-11, 14, 16-17, 34-37, 39-59, 62, 64-76, 110-125 stand rejected under 35 USC §101. Independent claims 1, 34, 66 and 121 and claims 4 and 9 have been amended to address the rejection and are believed to be directed to statutory subject matter under the provisions of 35 USC §101. Therefore, Applicants submit that claims 1-11, 14, 16-17, 34-37, 39-59, 62, 64-76, 110-125 fully satisfy the requirements of 35 USC §101 and are patentable thereunder.

IV. REJECTIONS UNDER 35 USC §112, SECOND PARAGRAPH

Claims 6, 23, 101, 110-112 and 122 stand rejected under 35 USC §112, second paragraph. Claims 6, 23, 101 and 122 have been amended to recite that the rules "are determined by a rewriting logic which is reflective." As stated in the specification, rewriting logic can be used to determine the set of rules (pages 7-9), and such rewriting logic is

258349-1

S/N 09/855,458
Page 20 of 26

reflective (page 9, lines 11-15).

Claims 41 and 110 stand rejected under 35 USC §112, second paragraph. Claims 41 and 110 are amended to recite that "rules which are non-terminating cause infinite substitution chains." Support for the amendment can be found at page 8, lines 13-16 which define rules which are non-terminating, and that non-termination rules can cause infinite substitution chains.

Applicants submit that claims 16, 23, 101 and 122 and claims 41 and 110, 111 and 112 fully satisfy the requirements of 35 USC §112, second paragraph and are patentable thereunder.

V. REJECTIONS UNDER 35 USC §102(b)

Claims 1-4, 5, 7, 8, 10, 11, 14, 34-37, 51, 52, 54, 56, 57, 59 and 62 stand rejected under 35 USC §102(b) as being anticipated by Kohn (Molecular Biology of the Cell, 1999, Vol. 10, pages 2703-2734).

The Office Action states that Kohn discloses a method that can be used in the generation of functional models (page 2703, col. 2, lines 7-8 and 16-18) to organize interactions via symbols in the form of a diagram, map, and database (abstract, lines 1-2 and 5-6). Kohn discloses representing modifications by unique graphical constructs (page 2704, col. 1, lines 21-24) as well as actions or effects of each molecular species or interaction (page 2704, col. 1, lines 26-27). Kohn discloses the representation of all possible combinations is impractical (page 2704, col. 1, lines 33-36). Kohn discloses symbols, rules, and the representation of interactions as lines (page 2704, col. 1, lines 37-42 and Figure 1). Kohn discloses the rule that molecular species should only appear once in the diagram and various interactions are represented as various types of lines connecting the species (page 2704, col. 1, lines 37-42). Kohn discloses the associative relationship between at least two molecular species in Figure 6 as well as the substitution of one symbol by another shown in the seventh symbol example in Figure 1 as stated in claims 1, 2, 34, and 51. Kohn discloses alternative results due to the binding of different proteins at the same site (page 2704, col. 2, lines 19-23 and Figure 2) and a representation of effects specific to any combination of interactions (page 2704, col. 2, lines 25-29).

Kohn states on page 2703, column 1, that "the complexity of molecular interactions implicated in cell regulatory networks challenges human comprehension. The present work

258349-1

S/N 09/855,458
Page 21 of 28

describes and applies a diagram method designed to cope with these complexities." Kohn also states on page 2715, column 1 that "the primary objective here was to suggest how complex molecular interaction networks can be usefully displayed." (emphasis added).

Thus, Kohn emphasizes that the purpose of his maps is to facilitate human comprehension by visualizing molecular interactions. Kohn discusses the relationship between his maps to computer simulations, for example, on page 2715, column 1 and states that "the complexity of the map, however, demands that great care be taken in formulation of specific functional hypotheses, which may have to be investigated with the aid of computer simulations."

Furthermore, Kohn teaches that the "hypotheses" could be investigated by computer simulations, not that the maps themselves could be used in the simulation. Kohn's maps include lines and other graphics for visualization by human users. Kohn does not teach or suggest how this graphic could be used, other than for viewing by a human user.

Therefore, Kohn merely teaches a diagram method designed to cope with the complexities of molecular interactions and suggests how complex molecular interaction networks can be usefully displayed. Kohn teaches that his maps facilitate human comprehension by visualizing molecular interactions and suggest the aid of computer simulations to investigate his hypotheses. Kohn does not teach that the maps themselves could be used in the simulation. Although the maps of Kohn include lines and other graphics for the visualization by a human user. Kohn does not teach or suggest how the lines and other is graphics could be used. Although Kohn discloses symbols and rules, Kohn does not teach the application of rules for the substitution of symbols. It is to be noted that the Office Action has relied on an excerpt from the specification to define "substitution." Applicants wish to point out that the excerpt is not a general description or definition of substitution, but merely describes a particular implementation for displaying an output state by use of a rewrite process. It is to be further noted that a rewrite process is also only a particular embodiment of the invention.

Therefore, the teachings in Kohn are not even remotely close to what is taught in claims 1 and 34. Nowhere does Kohn teach or suggest a method for determining the interaction of biological elements in a biological system, defining symbols which represent an initial hypothetical state of one or more biological elements, and the use of one or more rules that express a substitution of at least one symbol by at least another symbol and processing the rules with an inference engine by substituting symbols to infer from the

258349-1

S/N 09/855,458
Page 22 of 26

symbols representing the initial hypothetical state, alternative resultant states indicative of the presence of one or more biochemical characteristics of one or more biological elements. Kohn suggests the testing of hypotheses using maps and does not provide a concrete solution for what he characterizes as the complexity of molecular interactions in cell regulatory networks. Therefore, Kohn does not teach nor suggest Applicants' invention as described in claims 1 and 34.

Applicants submit that claims 1 and 34 are not anticipated by Kohn. Likewise, claims 2-11, 14, 16, 17, 35-37, 51-52, 54, 56-57, 59 and 62 which depend therefrom are also not anticipated by Kohn. Therefore, claims 1-4, 5, 7, 8, 10, 11, 14, 34-37, 51, 52, 54, 56, 57, 59 and 62 are allowable and withdrawal of the 35 U.S.C. §102(b) rejection is respectfully requested.

VI. REJECTIONS UNDER 35 USC §102(e)(2)

Claim 1 stands rejected under 35 USC §102(e)(2) as being anticipated by Yoshida et al (US Patent No. 6,438,496 B1).

The Office Action states that Yoshida discloses a method and apparatus that enables the recognition of a characteristic included in a symbolic sequence that was not previously recognized (col. 1, lines 8-17). Yoshida discloses genetic information specified by symbolic sequence (col. 1, lines 20-24). Yoshida discloses a symbolic sequence that is converted to a parallel sequence of partial symbolic sequences (col. 1, lines 57-60). Yoshida discloses alternatives of positional relation alignments (col. 2, lines 3-12). Yoshida discloses that the converted parallel sequence is outputted using one or more expression means such as hue, lightness, or saturation of color (col. 2, lines 17-20). Yoshida discloses operations, or rules, such as the one to extract letters from the parallel sequence of the partial symbolic sequence (col. 2, lines 26-31 and col. 3, lines 52-63) which is reasonably interpreted as a form of substitution. Yoshida discloses Figure 14 which represents extraction of symbolic sequence to be processed with changing the initial point, from a symbolic sequence M (col. 5, lines 6-8). Yoshida discloses using a computer processor for the above-mentioned method.

Claim 1 teaches a method for determining the interaction of biological elements in a biological system defining symbols which represent an initial hypothetical state of one or more biological element and the use of one or more rules that express a substitution of at

258349-1

S/N 09/855,458
Page 23 of 26

least one symbol by at least another symbol and processing the rules with an inference engine by substituting symbols to infer from the symbols representing the initial hypothetical state, alternative resultant states indicative of the presence of one or more characteristics of one or more biological elements. Nowhere does Yoshida's model of a single molecule teach or suggest rules that represent interactions between biological elements, nor does Yoshida's model teach or suggest the processing of any rules with an inference engine by the substitution of symbols to infer alternative resultant states from a hypothetical initial state. Therefore, Yoshida does not teach nor suggest Applicants' invention as described in claim 1.

Applicants submit that claim 1 is not anticipated by Yoshida. Thus claim 1 is allowable and withdrawal of the 35 U.S.C. 35 USC §102(e)(2) rejection is respectfully requested.

VII. REJECTIONS UNDER 35 USC §102(e)(1)

Claims 1, 2, 7, 8, 11, 14, 16, 17, 34-37, 39-40, 44-51, 56, 57, 62 and 64-76 stand rejected under 35 USC §102(e)(1) as being anticipated by Allen et al (Patent Application Pub. No. US 20020068269).

Allen discloses a method and system for examining a biological system, and for predicting interactions between biological elements (paragraphs 0002 and 0005). Allen discloses an inference engine linked to a database of known cellular components and reactions to generate signal cascades (paragraph 0007). Allen describes an inference engine [14] which works with database [80] and evaluates a sequence of logic statements to determine which cellular events should be triggered based on the cellular environment present at the decision making moment (paragraph 0030).

The Office Action states that Allen discloses an output module and a graphical display of the interactions in Figure 14 (and page 3, paragraph 0027). The Office Action makes the interpretation that the symbols of biological elements and lines represent substitutions or associations. The Office Action interprets the flowcharts depicted in Fig. 2A and 2B of Allen and the accompanying text, e.g., paragraphs 56 to 70, as representing an embodiment of "evaluat[ing] a sequence of logical statements."

The teachings in Allen are not even remotely close to what is taught in claims 1, 34 and 66. Nowhere does Allen teach or suggest a method for determining the interaction of biological elements in a biological system defining symbols which represent an initial

258349-1

S/N 09/855,458
Page 24 of 26

hypothetical state of one or more biological elements, and the use of one or more rules that express a substitution of at least one symbol by at least another symbol and processing the rules with an inference engine by substituting symbols to infer from the symbols representing the initial hypothetical state, alternative resultant states indicative of the presence of one or more biochemical characteristics of the one or more biological elements and as stated in claim 66, such substitution is carried iteratively. It is to be noted that the Office Action has relied erroneously on an excerpt from the specification to define "substitution." Applicants wish to point out that the excerpt is not a general description or definition of substitution, but merely describes a particular implementation for displaying an output state by using a rewrite process. Moreover, use of a rewrite process is also only a particular embodiment of the invention.

The description by Allen of "events" and "evaluating a sequence of logical statements" does not teach or suggest using rules that express a substitution of symbols in a manner that enables an inference engine to process them. Moreover, Allen does not teach or suggest processing an initial hypothetical state using such rules or iteratively substituting symbols using any rules to determine an alternative or terminal state indicative of the presence of one or more biochemical characteristics of the one or more biological elements. Nowhere does Allen teach or suggest the substitution of symbols and the output module of Allen produces a static display of pathways (paragraph 0122), a dynamic display of pathways (paragraph 0123) and a preferred textual display (paragraph 0124). Therefore, Allen does not teach nor suggest Applicants' invention in claims 1, 34 and 66 and claims 2, 7, 8, 11, 14, 16, 17, 35-37, 39-40, 44-51, 56, 57, 62 and 64, 65, 67-76 that depend therefrom.

Applicants submit that claims 1, 2, 7, 8, 11, 14, 16, 17, 34-37, 39-40, 44-51, 56, 57, 62 and 64-76 are not anticipated by Allen. Thus claims 1, 2, 7, 8, 11, 14, 16, 17, 34-37, 39-40, 44-51, 56, 57, 62 and 64-76 are allowable and withdrawal of the 35 U.S.C. 35 USC §102(e)(1) rejection is respectfully requested.

VIII. REJECTIONS UNDER 35 USC §102(e)(1) and (2)

Claims 1, 2, 7, 8, 11, 14, 16, 17, 34-37, 39-40, 42-51, 56, 57, 62 and 64-76 stand rejected under 35 USC §102(e)(1) and (2) as being anticipated by Allen and Fant et al (U.S. Patent No. 5,805,461).

258349-1

S/N 09/855,458
Page 25 of 26

The Office Action states that Allen describes the limitations of claims 1, 2, 7-8, 11, 14, 16-17, 34-40, 44-51, 56-57, 62, and 64-76. As discussed above, Allen does not anticipate claims 1, 2, 7-8, 11, 14, 16-17, 34-40, 44-51, 56-57, 62, and 64-76.

Claims 42 and 43 have been amended and no longer refer to a wiring diagram. None of the other claims refer to a wiring diagram. Thus the rejection of the claims as being anticipated by Allen and Fant is now moot.

Applicants submit that claims 1, 2, 7, 8, 11, 14, 16, 17, 34-37, 39-40, 42-51, 56, 57, 62 and 64-76 are not anticipated by Allen and Fant and are thus allowable. Withdrawal of the 35 USC §102(e)(1) and (2) rejection is respectfully requested.

IX. REJECTIONS UNDER 35 USC §103(a)

Claims 18-22, 24, 25, 27, 30, 96-100, 102, 103 and 106-108 stand rejected under 35 USC §103(a) over Kohn and Allen.

As discussed above, Kohn and Allen do not teach or suggest the limitations of claims 18-20, 22, 24-25, 27, 30, 96-98, 100, 102-103, and 106-108. As acknowledged in the Office Action, Kohn and Allen lack a machine-readable medium having encoded the limitations of claims 18-20, 22, 24-25, 27, 30, 96-98, 100, 102-103, and 106-108.

The article of claim 18 incorporates the limitations of claim 1 and the article of claim 96 incorporates the limitations of claim 66. The article of claim 106 incorporates limitations such as those set forth in claims 1 and 66. As discussed above, neither Kohn nor Allen teach or suggest the limitations of claims 1 or 66, and thus do not motivate the limitations of claims 18, 96 and 106 and their dependent claims.

Thus, neither Kohn nor Allen alone or in combination render obvious claims 18-22,

S/N 09/855,458
Page 26 of 26

24, 25, 27, 30, 96-100, 102, 103 and 106-108 under 35 USC §103(a). Thus claims 18-22, 24, 25, 27, 30, 96-100, 102, 103 and 106-108 are allowable and withdrawal of the 35 USC §103(a) rejection is respectfully requested.


CONCLUSION

Thus, Applicants submit that all claims now pending are in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issuance are earnestly solicited.

If, however, the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone the undersigned at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

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Respectfully submitted,



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258349-1